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## THREE CASES OF GYNANDROMORPHISM IN GONEPTERYX:

AN OBSERVATION WITH ULTRAVIOLET RAYS

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WHILE REVISING THE GONEPTERYX cabinet in the Lepidoptera Collection at the Zoological Museum, Kiev Shevchenko State University, I found three gynandromorphic specimens of *Gonepteryx*: two of *G. rhamni* L. and one of *G. cleopatra* L., species that have been photographed with UV-light using the method described previously (Nekrutenko, 1964). Results of this observation seem to be interesting enough to publish them here together with brief remarks.

The phenomenon of gynandromorphism is well known among the Lepidoptera, but it occurs in various groups with different frequency. Anomalies of embryogenesis during the very initial stages results in various parts of the insect's body that are marked with characters of different sex. In some cases the body of an insect seems to be formed from two halves, one bearing characteristics of, say, female — the other one, of male (bilateral gynandromorphism). In other cases characters of different sex are mosaically distributed on the ground of normal tissues of the specimen (mosaic gynandromorphism).

A. A. Jachontov (1935) explains the cause of gynandromorphism by the abnormal division of nuclear substance in the division of the fertilized egg; if this takes place at the very first division, a bilateral gynandromorph arises. If such an anomaly occurs at the later stages of the egg division, the gynandromorph will be a mosaic. S. A. Hessell (1964) noted that a bilateral gynandromorph may arise as a result of "a binucleate ovum or by the loss somehow of an X chromosome in the very first cell division". It is interesting to note that both *G. rhamni* and *G. cleopatra* are mentioned by Schultz (1904) as a species with high frequency of gynandromorphic aberrations. From a total of 1074 gynandromorphs known to him, 45 are of *G. rhamni* and 41 of *G. cleopatra* (cited by A. A. Jachontov, 1935).

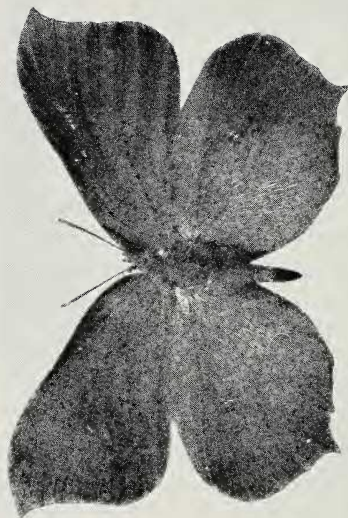
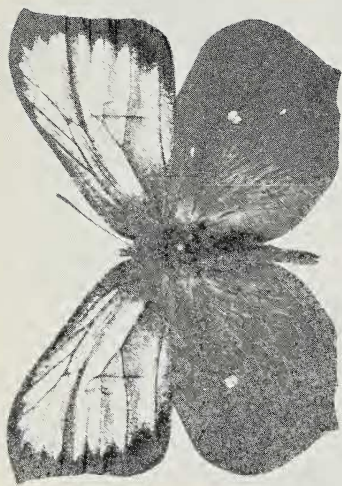
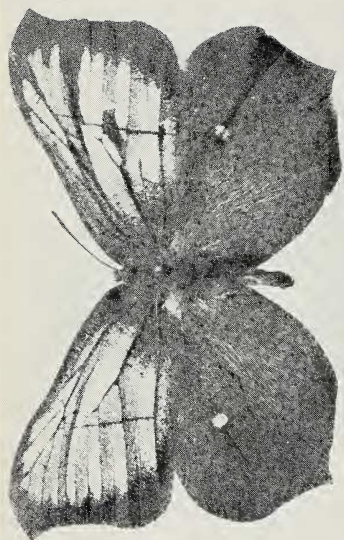


Fig. 1. *Gonepteryx rhamni* L., normal ♀.  
 Fig. 2. *G. rhamni* L., normal ♂.  
 Fig. 3. *G. rhamni* L., ♂ gynandromorph. Wien, Coll. L. Sheljuzhko.  
 Fig. 4. *G. rhamni* L., ♀ gynandromorph. Kiev, 13.V.05, Weidinger leg.  
 Coll. L. Sheljuzhko.

GYNANDROMORPHISM IN *Gonepteryx rhamni* L.

In visible light the sexual dimorphism, or, more precisely, *dichroism* ( a term proposed by G. A. Mazokhin-Porshnyakov, 1957) is expressed in the fact that the wings of the male are smooth yellow, with small orange points in the transverse veins of both fore and hindwings. The coloration of the female is also smooth, but green-yellowish.

In ultra-violet light the sexual dichroism can be seen in the male by the presence of a hidden wing-pattern, while the female appears smoothly dark (see Figures 1, 2).

The optical nature of the hidden wing-pattern in *G. rhamni* will produce the "gynandromorphic effect" when the subject and the source of light are arranged so that the bright central field of one side will absorb ultra-violet rays (Nekrutenko, 1965).

One of the two specimens under consideration (Wien, Coll. L. Sheljuzhko) is a male in which some stripes of female color can be traced in the right forewing. Under ultra-violet light it is easily seen that these stripes have the dark color of the entire surface of a female wing, highly contrasting on the ground color of the male's hidden pattern (see Figure 3).

Another specimen (Kiew, 13.V.05, Weidinger leg., Coll. L. Sheljuzhko) is a female with areas of male color in the right forewing (between the medial line of cell  $M_3-C_1$  and dorsum) and in the foremost part of the hindwing. In the ultra-violet picture, this gynandromorphism is visible on the fore wing only, since the color of the hindwing in female and male is the same (see Figure 4). It is interesting to note that in the area of male color, in the uv picture, all elements of the hidden pattern are visible: the *zona opaca marginalis* and the *linea opaca medialis* on the ground of the bright central field. It is especially interesting to note the fact that gynandromorphism is expressed here not only by a color aberration, but also by an aberration of structure.



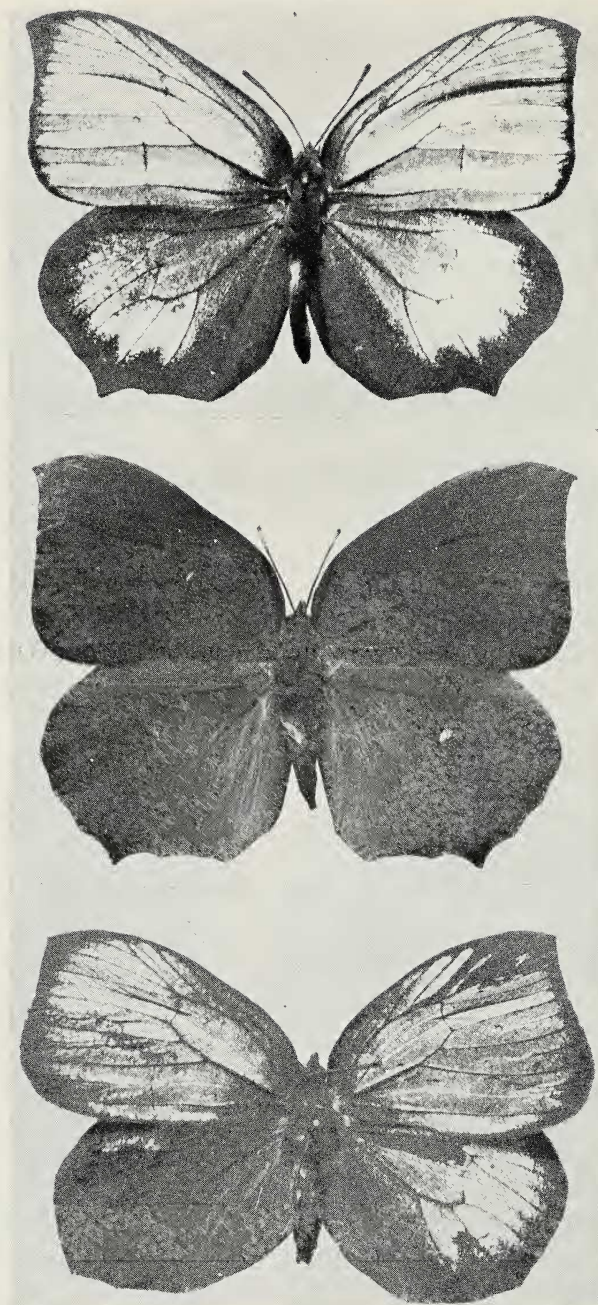


Fig. 5. *Gonepteryx cleopatra* L., normal ♂. Fig. 6. *G. cleopatra* L., normal ♀. Fig. 7. *G. cleopatra* L., monstrous gyandromorph. Dalmatia, Coll. L. Sheljuzhko.

GYANDROMORPHISM IN *Gonepteryx cleopatra* L.

In this species, the sexual dichroism is seen in the male as a large orange spot in the upper surface of the forewing, while the rest of the surface is occupied by yellow *rhamni*-like color. The female is much like *rhamni* but the color is warmer, creamy yellow.

In ultra-violet light, the male has a narrow *zona opaca marginalis*, the same shape as the above orange spot. On the hindwing, the *macula lucida centralis* is very large and could be called *area lucida centralis alis posteriori*. The female is dark, as in *rhamni*. See Fig. 5 and 6.

Another specimen, marked in the label as a male, is a monstrous butterfly. The label determination is: *dalmatica* Vty. (= *italica* Gerh.) ab. (gynandromorph). From *Dalmatia* (Coll. L. Sheljuzhko). The right forewing in both visible and uv-light bears strips of female color. The left forewing is colored as a normal male. The right hindwing has a large central bright spot on the ground, in which dark stripes of female color can be seen in visible light. The left hindwing is dark in ultra-violet and of female color in visible light.

All three cases described are mosaic gynandromorphs. In spite of the fact that no examples of bilateral ones are available, the author believes that should a bilateral gynandromorph be found, it will appear as he described in 1965.

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